

Title: Twisted Time

Brief Overview:

Students will be involved in calculating time of a reading contest between four classes. They will discover that there are many ways to express time using equivalent measures. This unit will encompass the skills of time, fractions, decimals, and estimation.

Links to NCTM Standards:

- **Mathematics as Problem Solving**

Students will evaluate different expressions of time and convert them to a common unit of measure. They also will create and interpret a table in order to rank the classes during a reading incentive.

- **Mathematics as Communication**

Students will demonstrate an ability to express their strategies and explain their methods of converting units of time. They will explain orally in classroom discussion and through written response in math journals.

- **Mathematics as Reasoning**

Students will demonstrate their ability to reason mathematically by using decision making skills to construct tables.

- **Mathematical Connections**

Students will be writing to persuade the principal to provide awards upon the completion of the reading incentive. They will be touching upon a variety of mathematical skills including time, fractions, decimals, addition, subtraction, and comparison of different units of time.

- **Estimation**

Students will effectively use the strategy of rounding, working towards a solution of completing tables, and analyzing data.

- **Number Sense and Numeration**

Students will demonstrate their ability to apply estimation strategies in computation with the use of calculators in measurement and in problem solving. They will determine the reasonableness of solutions. Students will use applications which include fractions and decimals in the same problem.

- **Statistics and Probability**

Students will be converting data to complete tables. They will be using different methods of problem solving skills and write a conclusion based on their statistical information.

- **Fractions and Decimals**

Students will express time conversions using cuisenaire rods. Using their learned knowledge of fractions and decimals, students will prove their time conversions.

Grade/Level:

Grades 4-5

Duration:

5 one hour class periods

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Estimating, rounding and place value
- Constructing fractions with cuisenaire rods
- Addition and subtraction of fractions
- Using minutes to tell time to the quarter hour
- How to construct and interpret a table

Objectives:

Students will:

- work cooperatively in pairs.
- add and subtract fractions with like and unlike denominators.
- estimate time to the quarter hour before calculating.
- use cuisenaire rods to construct a representation of an hour and its fractional parts.
- convert representation of time to fractions and decimals.
- complete and interpret data represented in a table.

Materials/Resources/Printed Materials:

- Activity packets
- One cuisenaire rod set per four students
- Calculator, one per pair of students

Development/Procedures:**Day 1**

- Present the following situation to the class:
Your grade level has participated in a month long reading incentive program to challenge classes to read the most hours. You are a student in Ms. Elapsed Time's class. Your class has been nominated to organize and convert the data in order to determine the ranking of classes. In the following task, the amount of hours will be presented to you in a variety of ways. It will be your job to convert the data. In conclusion, you and your classmate will be asked to write a persuasive letter to the principal convincing him of class awards.
Good Luck!
- Pass out the Student Resource Packets, which include Student Resource Sheets. Assign students a partner to work with for the duration of the project. Familiarize students with the set up of the table for week one. Explain that today students will be given the amount of minutes which need to be rounded to the nearest tens place and then converted to the amount of hours. Upon completion of the table, instruct students to complete the questions at the bottom of the worksheet. They may use calculators to complete the table.
- Discuss results of the table and questions as a class.

Day 2

- Have students refer to their Student Resource Sheet 2. Discuss the given information, (amount of minutes). Have students explain what parts of the table are missing and verbalize their strategy choice for conversion.
- At this time, the teacher should distribute one set of cuisenaire rods to each pair of students and ask students to remove one brown rod. Explain that the brown rod will represent one hour. Review how many minutes make up an hour. (60 minutes = 1 hour) Then ask students how they can show the division of an hour into two equal parts. (2 purple rods). Students should explain why they chose the purple rod and what it represents. (Each represents 30 minutes). Have students explore which rod would divide the hour into four equal parts. (4 red rods) Students should explain why they chose the red rod and what it represents (Each represents 15 minutes). Inform the students that this model will enable them to be successful in the completion of the table over the next several days. They may choose to use calculators.
- Allow students to work with partner to complete the table and questions. Discuss results of the table and questions as a class. Compare results with week one.

Day 3

- Begin class by reviewing converting fractional time to decimal time. (i.e., $4 \frac{3}{4} = 4.75$, $7 \frac{1}{4} = 7.25$, $3 \frac{1}{2} = 3.5$)
- Have students refer to Student Resource Sheet 3. Ask them what items are missing from the table and what column is new to the table. (missing = rounding column, added = decimal column).
- Remind students the benefit of using the cuisenaire rods to represent the parts of an hour. They may choose to use calculators to complete their table.
- Students should now work with their partner to complete the table, and answer the questions. Discuss the results of the table and questions as a class and compare with the previous days.

Day 4

- Introduce Student Resource Sheet 4. Ask students how it is different from previous tables used this week. (A different time unit is provided from each teacher.)
- Students should now complete the table using the cuisenaire rods and/or calculator. Upon the completion of the table, students will need to rank the classes and provide written proof of their results.
- In a class discussion format, review the ranking of the classes and discuss the different problem solving methods used.
- In preparation for the performance assessment, have students brainstorm rewards for the reading incentive program.

Day 5 (Assessment Activity)

- Present this prompt to your class:

Your class has competed the ranking of the classes' reading incentive. There is only one problem. We don't have awards to give to the classes. Write a letter persuading your principal to provide awards for each class' hard work. Be sure to include mathematical data to support your request. (see rubric).

Performance Assessment:

The assessment for this mini-unit will be on-going. The students will be assessed on participation, completion of daily worksheets, anecdotal records, ability to work in cooperative groups, and the Day 5 Assessment Activity. A rubric is provided for scoring the final writing prompt.

Extension/Follow Up:

- Have your class plan and carry out a reading incentive program for your grade level.
- Create a classroom reading incentive program, where all the reading is done and recorded at home. Set a goal for your class to reach by the end of a certain time.

Authors:

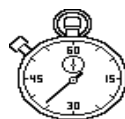
Mary Myers
Thurmont Elementary
Frederick County, MD

Amy Gehring
Halls Cross Roads Elementary
Harford County, MD

Twisted Time Assessment Activity

Task: Your class has completed the ranking of the class' reading incentive. There is only one problem. We don't have awards to give to the classes. Write a letter persuading your principal to provide awards for each class' hard work. Be sure to include mathematical data to support your request.

Week 1 Results



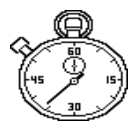
Student Resource Sheet 1

<i>Teacher</i>	<i>Given Minutes</i>	<i>Nearest TensPlace</i>	<i>Hours</i>	<i>Ranking</i>
Mr. Past Time	63 Minutes			
Ms. Elapsed Time	178 Minutes			
Ms. Over Time	121 Minutes			
Miss Outta Time	236 Minutes			

- 1) Rank the classes from the largest amount of time to the least amount of time. Use 1 to display the largest and 4 to display the lowest.
- 2) By the end of the month, predict which class will have the largest amount of reading minutes. Explain why.

- 3) Predict who will have accumulated the least amount of time. Explain why.

Week 2 Results



Student Resource Sheet 2

<i>Teacher</i>	<i>Given Minutes</i>	<i>Nearest TensPlace</i>	<i>Fractional Representation</i>	<i>Hours</i>	<i>Ranking</i>
Mr. Past Time	153 Minutes				
Ms. Elapsed Time	89 Minutes				
Ms. Over Time	238 Minutes				
Miss Outta Time	64 Minutes				

- 1) Rank the classes from the largest amount of time to the least amount of time. Use 1 to display the largest and 4 to display the lowest.
- 2) How much more time did Mr. Past Time’s class read in week #2 compared to week #1. Determine the nearest ten, using the rounding strategy.

- 3) According to the table, what is the difference between Mr. Past Time’s hour and Miss Outta Time’s hour?

An analog stopwatch with a main dial and a sub-dial. The main dial has markings at 15, 30, 45, and 60. The sub-dial has markings at 10, 20, 30, 40, and 50. The main hand points to 15, and the sub-hand points to 45.

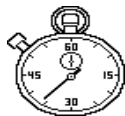
Student Resource Sheet 3

<i>Teacher</i>	<i>Given Minutes</i>	<i>Fractional Representation</i>	<i>Hours</i>	<i>Decimals</i>	<i>Ranking</i>
Mr. Past Time	300 Minutes				
Ms. Elapsed Time	165 Minutes				
Ms. Over Time	255 Minutes				
Miss Outta Time	90 Minutes				

- 1) Rank the classes from the largest amount of time to the least amount of time. Use 1 to display the largest and 4 to display the lowest.
- 2) Using results from Week 1, Week 2, and Week 3, determine which class has read the most hours. Show your work and explain using numbers and words.

[illegible]

Week 4 Results



Student Resource Sheet 4

<i>Teacher</i>	<i>Given Minutes</i>	<i>Fractional Representation</i>	<i>Hours</i>	<i>Decimal</i>	<i>Ranking</i>
Mr. Past Time	600 Minutes				
Ms. Elapsed Time			7 1/4 Hours		
Ms. Over Time		270/60			
Miss Outta Time				6.75 Hours	

- 1) Rank the classes from the largest amount of time to the least amount of time. Use 1 to display the largest and 4 to display the lowest.
- 2) It's the big day! Who is the winner of the reading incentive program? Determine which class has read the most hours. Show your work and explain using numbers and words.

Calculations

Week 1 Results



<i>Teacher</i>	<i>Given Minutes</i>	<i>Nearest Tens Place</i>	<i>Hours</i>	<i>Ranking</i>
Mr. Past Time	63 Minutes	60 Minutes	1 hour	4
Ms. Elapsed Time	178 Minutes	180 Minutes	3 hours	2
Ms. Over Time	121 Minutes	120 Minutes	2 hours	3
Miss Outta Time	236 Minutes	240 Minutes	4 hours	1

Week 2 Results



<i>Teacher</i>	<i>Given Minutes</i>	<i>Nearest Tens Place</i>	<i>Fractional Representation</i>	<i>Hours</i>	<i>Ranking</i>
Mr. Past Time	153 Minutes	150 Minutes	2 1/2 hours	150/60	2
Ms. Elapsed Time	89 Minutes	90 Minutes	1 1/2 hours	90/60	3
Ms. Over Time	238 Minutes	240 Minutes	4 hours	240/60	1
Miss Outta Time	64 Minutes	60 Minutes	1 hours	60/60	4

Week 3 Results



<i>Teacher</i>	<i>Given Minutes</i>	<i>Fractional Representation</i>	<i>Hours</i>	<i>Decimals</i>	<i>Ranking</i>
Mr. Past Time	300 Minutes	300/60	5 hours	5.00 hours	1
Ms. Elapsed Time	165 Minutes	165/60	2 3/4 hours	2.75 hours	3
Ms. Over Time	255 Minutes	255/60	4 1/4 hours	4.25 hours	2
Miss Outta Time	90 Minutes	90/60	1 1/2 hours	1.50 hours	4

Week 4 Results



<i>Teacher</i>	<i>Given Minutes</i>	<i>Fractional Representation</i>	<i>Hours</i>	<i>Decimals</i>	<i>Ranking</i>
Mr. Past Time	600 Minutes	600/60	10 hours	10.00 hours	1
Ms. Elapsed Time	435 Minutes	435/60	7 1/4 hours	7.25 hours	2
Ms. Over Time	270 Minutes	270/60	4 1/2 hours	4.50 hours	4
Miss Outta Time	405 Minutes	405/60	6 3/4 hours	6.75 hours	3

TWISTED TIME RUBRIC

- 3** All time measurements are accurate.
Math reasoning is clear and correct.
Written work is neat, organized, and
utilizes proper mathematical language.
- 2** Most time measurements are accurate.
Math reasoning is clear and mostly correct.
Written work is neat, organized, and
utilizes proper mathematical language.
- 1** Some time measurements are accurate.
Some math reasoning is evident.
Written work is legible and has some
organization.
- 0** Very few measurements are accurate.
There is little evidence of math reasoning.
Written work is unorganized.